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10/634,874

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EXAMINER

MARC, MCDIEUNEL

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/634,874	Applicant(s) HABIBI ET AL.	
	Examiner MCDIEUNEL MARC	Art Unit 3664	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 05 June 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 33-61 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) all is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

1. Claims 33-47 and 49-61 are pending.
2. The rejection to c Claims 33-47 and 49-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Parker et al. (US 7024280) is withdrawn in view of new applied prior art.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 33-47 and 49-61 are rejected under 35 U.S.C. 102(b) as being anticipated by **Wei et al. (*Multisensory Visual servoing by a Neural Network*, 1999)**.

As per claim 33, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a capturing a number of images of a calibration object (see fig. 4) by the camera; determining a set of intrinsic parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) of the camera (see figs. 2-3) from at least one of the number of images of the calibration object (see fig. 4) captured by the camera; and determining a set of extrinsic parameters (see page 1, col. 1, second paragraph, wherein both

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intrinsic and extrinsic parameters have been covered) of the camera (see figs. 2-3) from at least one of the number of images of the calibration object (see fig. 4) captured by the camera, the set of extrinsic parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) comprising a camera (see figs. 2-3) space-to-training space transformation defining a transformation between a camera (see figs. 2-3) space reference frame and a training space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame) .

As per claim 34, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a positioning the camera (see figs. 2-3) with respect to the calibration object (see fig. 4).

As per claim 35, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method wherein positioning the camera (see figs. 2-3) with respect to the calibration object (see fig. 4) comprises positioning the camera (see figs. 2-3) orthogonally with respect to a ruled template with a number of features (see page 5, table II, which has been considered as template), where a known or determinable physical relationship exists between at least some of the features (see page 2, col. 1).

As per claim 36, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method wherein positioning the camera (see figs. 2-3) with respect to the calibration object (see fig. 4) comprises positioning the camera (see figs. 2-3) with respect to a sample of a type of object (see fig. 4) the robot (see fig. 3) will manipulate, the sample having a number of features, where a known or determinable physical relationship exists between at least some of the features (see page 2, col. 1).

As per claim 37, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method wherein capturing a number of images of a calibration object (see fig. 4) by the camera (see figs. 2-3) comprises capturing at least one image at each of a plurality of positions spaced perpendicularly from the calibration object (see fig. 4).

As per claim 38, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method wherein capturing a number of images of a calibration object (see fig. 4) by the camera (see figs. 2-3) comprises capturing at least one image at each of a plurality of different orientations with respect to the calibration object (see fig. 4).

As per claim 39, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method wherein determining a set of intrinsic parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) of the camera (see figs. 2-3) from the at least one of the number of images of the calibration object (see fig. 4) captured by the camera (see figs. 2-3) comprises determining at least one of a focal length, a first order radial lens distortion coefficient, a set of coordinates of a center of a radial lens distortion, or a scale factor indicative of a framegrabber scanline resampling uncertainty.

As per claim 40, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method wherein determining a set of extrinsic parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) of the camera (see figs. 2-3) from at least one of the number of images of the calibration object (see fig. 4) captured by the camera, the set of extrinsic parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) comprising a camera (see figs. 2-3) space-to-training space transformation defining a transformation between a camera (see figs. 2-3)

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space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame) and a training space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame) comprises determining a respective translation component along three orthogonal axes, and a respective rotation component about the three orthogonal axes.

As per claim 41, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method that further comprising: determining a camera (see figs. 2-3) space-to-tool space transformation based at least in part on at least two of the number of images captured by the camera (see figs. 2-3) of the calibration object (see fig. 4).

As per claim 42, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method that further comprising: determining a camera (see figs. 2-3) space-to-tool space transformation based on single one of the number of images captured by the camera (see figs. 2-3) of the calibration object (see fig. 4) and on a number of physical coordinates of at least one feature of the calibration object (see fig. 4).

As per claim 43, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method that further comprising: capturing an image of a teaching object (see fig. 4) of a type of object (see fig. 4) that will be manipulated by the robot; selecting a number of features (see page 2, col. 1) from the captured image of the teaching object (see fig. 4); determining a set of object (see fig. 4) space coordinates for each of the selected features (see page 2, col. 1) I from the captured image of the teaching object (see fig. 4).

As per claim 44, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method wherein selecting a number of features (see page 2, col. 1) from the captured

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image of the teaching object (see fig. 4) comprises selecting six features (see page 2, col. 1) from the captured image of the teaching object (see fig. 4).

As per claim 45, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method that further comprising:
determining an object (see fig. 4) space-to-camera (see figs. 2-3) space transformation defining a transformation between an object (see fig. 4) space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame) and the camera (see figs. 2-3) space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame).

As per claim 46, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method that comprising: determining a position and an orientation of an object (see fig. 4) frame in the tool frame reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame) based at least in part on the object (see fig. 4) frame-to-camera (see figs. 2-3) space and camera (see figs. 2-3) space-to- tool space transformations (see abstract, pages 1-2 and fig. 2).

As per claim 47, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method that further comprising: providing the position and orientation of the object (see fig. 4) frame to the robot; and training an intended operation path inside the object frame (see abstract and fig. 4).

As per claim 49, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method that further comprising: adjusting a position of the movable portion of the robot (see fig. 3) if the number of features (see page 2, col. 1) located in the captured image of

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the target object (see fig. 4) is determined to be an insufficient number of features; and capturing another two-dimensional image of the volume containing the target I object (see fig. 2-4, wherein image taken by the camera being considered has having the capacity to do two- or three-dimensional images) before determining the object (see fig. 4) space-to-camera (see figs. 2-3) space transformation for the target object (see fig. 4).

As per claim 50, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method that useful in three-dimensional pose estimation for use with a single camera (see figs. 2-3) mounted to a movable portion of a robot, the method comprising: capturing a two-dimensional image of a volume containing a target object (see fig. 4); locating a number of features (see page 2, col. 1) in the captured image of the target object (see fig. 4); and determining an object (see fig. 4) space-to-camera (see figs. 2-3) space transformation for the target object (see fig. 4) based at least in part on a position of at least some of the located features (see page 2, col. 1) using only the captured image and an algorithm that employs a known or determinable physical relationship between at least some of the located features (see page 2, col. 1).

As per claim 51, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method that further comprising: determining at least one movement of the robot (see fig. 3) that orients the camera (see figs. 2-3) orthogonally with respect to the target object (see fig. 4) based at least on part on the object (see fig. 4) space-to-camera (see figs. 2-3) space transformation (see abstract, pages 1-2 and fig. 2).

As per claim 52, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a method that comprising: determining a position of the object (see fig. 4) frame in the

tool space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame); and providing an object (see fig. 4) frame to the robot (see fig. 3).

As per claim 53, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system that useful in robotics, the apparatus comprising: a single camera (see figs. 2-3) operable to capture at a number of images of a calibration object (see fig. 4) means for calibrating the camera, by: determining a set of intrinsic parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) of the camera (see figs. 2-3) from at least one of the number of images of the calibration object (see fig. 4) captured by the camera; and determining a set of extrinsic parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) of the camera (see figs. 2-3) from at least one of the number of images of the calibration object (see fig. 4) captured by the camera, the set of extrinsic parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) comprising a camera (see figs. 2-3) space-to-training space transformation defining a transformation between a camera (see figs. 2-3) space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame) and a training space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame); and means for estimating a pose of a target object (see fig. 4), by: capturing a two-dimensional image of a volume containing a target object (see fig. 4); and locating at least six features (see page 2, col. 1) in the captured image of the target object (see fig. 4); and determining an object (see fig. 4) space-to-camera (see figs. 2-3) space transformation based at least in part on a position of at least some of the located features (see page 2, col. 1) in solely the captured image using an algorithm that employs a known or

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determinable physical relationship between at least some of the located features (see page 2, col. 1).

As per claim 54, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system that comprising: means for training, comprising: capturing an image of a teaching object (see fig. 4) of a type of object (see fig. 4) that will be manipulated by the robot; selecting a number of features (see page 2, col. 1) from the captured image of the teaching object (see fig. 4); determining a set of object (see fig. 4) space coordinates for each of the selected features (see page 2, col. 1) from the captured image of the teaching object (see fig. 4); an determining an object (see fig. 4) space-to-camera (see figs. 2-3) space transformation defining a transformation between an object (see fig. 4) space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame) and the camera (see figs. 2-3) space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame).

As per claim 55, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system wherein the means for calibrating, the means for estimating a pose, and the means for training comprises at least one programmed computer (see abstract, page 1, col. 1 and page 4, col. 2, second paragraph).

As per claim 56, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system wherein the means for calibrating, the means for estimating a pose, and the means for training comprises at least one computer-readable medium (see abstract, page 1, col. 1 and page 4, col. 2, second paragraph) storing instructions operating at least one computer (see abstract, page 1, col. 1 and page 4, col. 2, second paragraph).

As per claim 57, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system wherein the pose estimating means estimates the pose of the target object (see fig. 4) further by: adjusting a position of the movable portion of the robot (see fig. 3) if the number of features (see page 2, col. 1) located in the captured image of the target object (see fig. 4) is determined to be an insufficient number of features (see page 2, col. 1).

As per claim 58, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system that useful in robotics, the apparatus comprising:
a single camera (see figs. 2-3) operable to capture a number of images of a calibration object (see fig. 4) means for calibrating the camera, by: determining a set of intrinsic parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) of the camera (see figs. 2-3) from at least one of the number of images of the calibration object (see fig. 4) captured by the camera; and determining a set of extrinsic parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) of the camera (see figs. 2-3) from at least one of the number of images of the calibration object (see fig. 4) captured by the camera, the set of extrinsic parameters (see page 1, col. 1, second paragraph, wherein both intrinsic and extrinsic parameters have been covered) comprising a camera (see figs. 2-3) space-to-training space transformation defining a transformation between a camera (see figs. 2-3) space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame) and a training space reference frame (see page 2, col. 1, wherein reference frame has been considered as position frame) ; and means for estimating a pose of a target object (see fig. 4), by: capturing a two-dimensional image of a volume containing a target object (see fig. 4); locating at least five features (see page 2, col. 1) in the captured image of the target object

(see fig. 4); and determining an object (see fig. 4) space-to-camera (see figs. 2-3) space transformation based at least in part on a position of at least some of the located features (see page 2, col. 1) using the captured image without any additional captured images and an algorithm that employs a known or determinable physical relationship between at least some of the located features (see page 2, col. 1).

As per claim 59, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system wherein the means for calibrating and the means for estimating a pose comprises at least one programmed computer (see abstract, page 1, col. 1 and page 4, col. 2, second paragraph).

As per claim 60, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system wherein the means for calibrating and the means for estimating a pose comprises at least one computer-readable medium (see abstract, page 1, col. 1 and page 4, col. 2, second paragraph) storing instructions operating at least one computer (see abstract, page 1, col. 1, wherein “traditional computer” inherently works with computer-readable medium, and page 4, col. 2, second paragraph).

As per claim 53, **Wei et al.**, teaches a multisensory visual servoing by a neural network, including a system wherein the pose estimating means estimates the pose of the target object (see fig. 4) further by: adjusting a position of the movable portion of the robot (see fig. 3) if the number of features (see page 2, col. 1) located in the captured image of the target object (see fig. 4) is determined to be an insufficient number of features (see page 2, col. 1).

Response to Arguments

5. As to the reference does not use video images in autonomous mode (see figs. 2-3);

As to the sensor 114 not emit a signal (see fig. 2);

As to the reference not teaching a calibration of the video device 122 “or any other part of the robot” (see abstract);

As to the reference not teaching a robot (see fig. 3) that can grip object (see figs. 2-4)s in autonomous mode (see fig. 3);

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to MCDIEUNEL MARC whose telephone number is (571)272-6964. The examiner can normally be reached on 6:30-5:00 Mon-Thu.

If attempts to reach the examiner by telephone are unsuccessful, the examiner’s supervisor, Khoi Tran can be reached on (571) 272-6919. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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/McDieunel Marc/
Examiner, Art Unit 3664
August 24, 2009

/KHOI TRAN/
Supervisory Patent Examiner, Art Unit 3664